Nagarjuna College of Engineering & Technology, Bengaluru

An Autonomous Institute, Affiliated to VTU Belagavi

2023 Batch
Scheme & Syllabus
of
III Semester

As per the NEP 2020 Guidelines,
Choice-Based Credit System
&
Outcome-Based Education

CSE (Data Science)

w.e.f.
Academic Year 2024-2025

Vision

To prepare the next generation practitioners and researcher for data centric world by bringing together interdisciplinary faculty across the globe.

Mission

M1: To provide Skill Based Education to master the students in problem solving and analytical skills to enhance their niche expertise in the field Data Science

M2: To educate the students with latest technologies to update their knowledge in the field of Data Science

M3: To enable students to experience the Content Based Learning with premier quality data science education, research and industrial collaboration

M4: To enable students to become leaders in the Industry and Academia Nationally as well as internationally

M5: To guide students in research on Data Science, with the aim of having an ethical impact on society by tackling societal grand challenges

PROGRAM OUTCOMES (POs): Graduates of the Computer Science and Engineering – Data Science Program will be able to achieve the following

POs:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and Computer Science and Engineering principles to the solution of complex problems in Computer Science and Engineering.

PO2: Problem Analysis: Identify, formulate, research literature, and analyses complex Computer Science and Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design/Development of Solutions: Design solutions for complex Computer Science and Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of Complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Computer Science and Engineering problems.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex Computer Science and Engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional Computer Science and Engineering practice.

PO7: Environment and Sustainability: Understand the impact of the professional Computer Science and Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Computer Science and Engineering practice.

PO9: Individual and Team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex Computer Science and Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage Computer Science and Engineering projects and in multidisciplinary environments.

PO12: Life Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome (PSO)

PSO1: Ability to analyse complex computing issues and apply the principles to achieve related solution.

PSO2: Ability to design, implement and evaluate computing based solutions to meet range of computing requirements based in the data science.

PSO3: Ability to effectively communicate within diverse work group related to professional framework.

Program Educational Objectives (PEOs)

PEO 1: To make students competent for higher studies and employable, to meet industrial requirements.

PEO 2: To develop students having core competence in science, mathematics and fundamentals of Data Science to address ever changing industrial requirements globally.

PEO 3: To create academically conducive environment to learn engineering skills in the domains such as Data Analytics, Data Modelling, Data Visualization and Allied Technologies.

PEO 4: To enrich students with professional ethics, leadership qualities, and entrepreneurial skills.

PEO 5: An ability to engage in lifelong learning for effective adaptation to technological developments.

Nagarjuna College of Engineering and Technology, Bangalore

B.E. in CSE (Data Science)

Scheme of Teaching and Examinations 2023

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the academic year 2024-25)

III SEMESTER

Sl. No	Course	Course Code	Course Title	Teaching Department (TD) and Question Paper Setting Board (PSB)	Teaching Hours /Week				Examination				Credits
					Theory Lecture	Tutorial	Practical/ Drawing	Self -Study	Duration in hours	CIE Marks	SEE Marks	Total Marks	
					L	T	P	S					
1	BSC/ PCC	23MATS31	Mathematics for Computer Science	TD-PSB	2	2	0		03	50	50	100	3
2	IPCC	23CDI32	Foundation of Data Science using SQL	TD: PSB	3	0	2		03	50	50	100	4
3	IPCC	23CDI33	Object Oriented Programming using Java	TD: PSB	3	0	2		03	50	50	100	4
4	PCC	23CDT34	Data Structures and Applications	TD: PSB	3	0	0		03	50	50	100	3
5	PCCL	23CDL35	DS Lab using C	TD: PSB	0	0	2		03	50	50	100	1
6	ESC	23CDT36x	ESC/ETC/PLC	TD: PSB:	3	0	0		03	50	50	100	3
7	UHV	23UHV37	Social Connect and Responsibility	Any Department	0	0	2		01	100	---	100	1
8	AEC/ SEC	23CDL38x	Ability Enhancement Course/Skill Enhancement Course - III		If offered as Theory courses: 1	0	0		01	50	50	100	1
					If offered as lab. courses: 0	0	2		02				
9	MC	23NS39	National Service Scheme (NSS)	NSS coordinator	0	0	2			100	---	100	0
		23PE39	Physical Education (PE) (Sports and Athletics)	Physical Education Director									
		23YO39	Yoga	Yoga Teacher									
								Total	**21**	**550**	**350**	**900**	**20**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **UHV**: Universal Human Value Course, **MC**: Mandatory Course (Non-credit), **AEC**: Ability Enhancement Course, **SEC**: Skill Enhancement Course, **L:** Lecture, **T**: Tutorial, **P**: Practical **S= SDA**: Skill Development Activity, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. K : This letter in the course code indicates common to all the stream of engineering. ESC: Engineering Science Course, ETC: Emerging Technology Course, PLC: Programming Language Course

Engineering Science Course (ESC/ETC/PLC)

23CDT36A	IT Infrastructure and Management	23CDT36C	Supply Chain Management
23CDT36B	Business Process Fundamentals	23CDT36D	Human Computer Interaction

Ability Enhancement Course – III (All are Laboratory Courses 0-0-2)

23CDL38A	Introduction to Android Programming	23CDL38C	Introduction to Office Tools
23CDL38B	Advanced Python Programming	23CDL38D	Introduction to Linux/Unix Shell Programming

Professional Core Course (IPCC): Refers to Professional Core Course Theory Integrated with practicals of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L : T : P) can be considered as (3 : 0 : 2) or (2 : 2 : 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper. For more details, the regulation governingthe Degree of Bachelor of Engineering /Technology (B.E./B.Tech.) 2022-23 may please be refered.

National Service Scheme /Physical Education/Yoga: All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education(PE)(Sports and Athletics), and Yoga(YOG) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, and Yoga activities. These courses

Shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.

MATHEMATICS FOR COMPUTER SCIENCE			
Course Code	**23MATS31**	**CIE Marks**	**50**
Course Type	**Theory**	**SEE Marks**	**50**
Teaching Hours/Week (L: T: P: S)	**2:2:0:0**	**Total Marks**	**100**
Total Hours of Pedagogy	**40 hours**	**Exam Hours**	**03**
		Credits	**03**

Course objectives:

The goal of the course **Mathematics for Computer Science** is to,

1. Introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations.
2. Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses.
3. Determine whether an input has a statistically significant effect on the system's response through ANOVA testing.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teacher can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the delivered lessons shall develop students theoretical and applied mathematical skills.
2. State the need for Mathematics with Engineering Studies and Provide real-life examples.
3. Support and guide the students for self–study.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress.
5. Encourage the students for group learning to improve their creative and analytical skills.
6. Show short related video lectures in the following ways:
   - As an introduction to new topics (pre-lecture activity).
   - As a revision of topics (post-lecture activity).
   - As additional examples (post-lecture activity).
   - As an additional material of challenging topics (pre-and post-lecture activity).
   - As a model solution of some exercises (post-lecture activity).

Module – I

Probability Distributions:

Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean and variance. Binomial, Poisson and normal distributions- problems (derivations for mean and standard deviation for Binomial and Poisson distributions only). . **08 Hours**

[Text 1: 26.1, 26.2, 26.7, 26.8, 26.9, 26.10, 26.13, 26.14, 26.15, 26.16]

[RBT Levels: L1, L2 and L3]

Self-Study: Exponential distribution.

Applications: Used for Modeling and prediction, analyzing data, algorithm design, cryptography, error detection, machine learning , computer vision, computer graphics, random number generation and natural language processing.

Module - II

Joint probability distribution & Markov Chain:

Joint probability distribution: Joint Probability distribution for two discrete random variables, expectation, covariance and correlation.

Markov Chain: Introduction to Stochastic Process, Probability Vectors, Stochastic matrices, Regular stochastic matrices, Markov chains, Higher transition probabilities, Stationary distribution of Regular Markov chains and absorbing states. **08 Hours**

[Text 3: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 5.6, 5.7]

[RBT Levels: L1, L2 and L3]

Self-Study: Joint Probability distribution for two continuous random variables.

Applications: Joint distribution for system design and maintenance decisions. Markov chain for algorithmic design and networking.

Module – III

Statistical Inference 1:

Introduction, sampling distribution, standard error, testing of hypothesis, levels of significance, test of significances, confidence limits, simple sampling of attributes, test of significance for large samples, comparison of large samples. Sampling variables, central limit theorem and confidence limit for unknown mean. Test of Significance for means of two large samples. **08 Hours**

[Text 1: 27.1, 27.2, 27.3, 27.4 27.5, 27.6, 27.7, 27.8, 27.9, 27.10, 27.11, 27.12]

[RBT Levels: L1, L2 and L3]

Applications: Decision making and problem solving, software testing and quality control

Module – IV

Statistical Inference 2:

Sampling of variables-small samples, students 't' distribution, Chi-square distribution as a test of goodness of fit. F-Distribution. **08 Hours**

[Text 1: 27.13, 27.14, 27.15, 27.16, 27.17, 27.18, 27.19]

[RBT Levels: L1, L2 and L3]

Self-Study: Fisher's Z-Distribution.

Applications: Algorithm performance evaluation, Software testing, Hardware testing, Quality assurance, Biometric systems, Network security, database management, Biomedical informatics, Information retrieval, signal processing and image processing.

Module – V

Design of Experiments and ANOVA:

Principles of experimentation in design, Analysis of completely randomized design, randomized block design. The ANOVA Technique, Basic Principle of ANOVA, One-way ANOVA, Two-way ANOVA, Latin-square Design, and Analysis of Co-Variance. **08 Hours**

[Text 2:]

[RBT Levels: L1, L2 and L3]

Applications: Algorithm Optimization, Network performance, Database management, User experience design and Hardware design.

Teaching-Learning Process for all modules	**Chalk and Talk/PowerPoint presentation/YouTube videos.**

Course Outcomes(Course Skill Set):

After successfully completing the course, the students will be able to:

CO1: Understand the basic concepts of probability, random variables, probability distribution and apply suitable probability distribution models for the given scenario.

CO2: Learn the concept of joint distribution and make use of the notion of a discrete-time Markov chain and n-step transition probabilities to solve the engineering application problem.

CO3: Use statistical methodology and tools in the sampling analysis.

CO4: Compute the confidence intervals for the mean of the population by using different tests.

CO5: Apply the ANOVA test related to engineering problems.

Evaluation Details:

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Suggested Learning Resources:

Text Books:

1. **B. S. Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed.2021.
2. **Ronald E. Walpole, Raymond H Myers, Sharon L Myers & Keying Ye** "Probability & Statistics for Engineers & Scientists", Pearson Education, 9th edition, 2017.
3. **Seymour Lipschutz and Marc Lars Lipson:** "Probability", (Chapters: 5 and 8), McGraw Hill Education (India) Private Limited, Chennai, Special Indian Edition, 2010.

Reference Books:

1. **Erwin Kreyszig**, "Advanced Engineering Mathematics", John Wiley & Sons, 9th Edition, 2006.
2. **Peter Bruce, Andrew Bruce & Peter Gedeck** "Practical Statistics for DataScientists" O'Reilly Media, Inc., 2nd edition **2020**.
3. **G Haribaskaran** "Probability, Queuing Theory & Reliability Engineering", Laxmi Publication, Latest Edition, 2006.
4. **Irwin Miller & Marylees Miller,** John E. Freund's "Mathematical Statistics with Applications" Pearson. Dorling Kindersley Pvt. Ltd. India, 8th edition, 2014.
5. **S C Gupta and V K Kapoor**, "Fundamentals of Mathematical Statistics", S Chand and Company, Latest edition.
6. **Robert V. Hogg, Joseph W. McKean & Allen T. Craig**. "Introduction to Mathematical Statistics", Pearson Education 7th edition, 2013.
7. **Jim Pitman**. Probability, Springer-Verlag, 1993.
8. **Sheldon M. Ross,** "Introduction to Probability Models" 11th edition. Elsevier, 2014.
9. **A. M. Yaglom and I. M. Yaglom**, "Probability and Information". D. Reidel Publishing Company. Distributed by Hindustan Publishing Corporation (India) Delhi, 1983.
10. **P. G. Hoel, S. C. Port and C. J. Stone**, "Introduction to Probability Theory", UniversalBook Stall, (Reprint), 2003.
11. **S. Ross**, "A First Course in Probability", Pearson Education India, 6th Ed., 2002.
12. **W. Feller**, "An Introduction to Probability Theory and its Applications", Vol. 1, Wiley, 3rd Ed., 1968.
13. **N.P. Bali and Manish Goyal**, A Textbook of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
14. **Veerarajan T**, Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

E-Resources:

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU e-Shikshana Program
- VTU EDUSAT Program

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes
- Assignments
- Seminars

CO PO Mapping:

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
23MATS31.1	3	3	1									
23MATS31.2	3	3	2									
23MATS31.3	3	3										
23MATS31.4	3	3										
23MATS31.5	2	3	1									

Level 3-Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0-Not Mapped

FOUNDATION OF DATA SCIENCE USING SQL

Course Code	**23CDI32**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:2:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40 hours Theory + 13 Lab slots**	**Total Marks**	**100**
Credits	**04**	**Exam Hours**	**03**

Course Learning Objectives

This course will enable students to:

1. Provide a strong foundation for data science and application areas related to it.
2. Learn the process of working with data on large scale.
3. Explore the concepts of Data Processing.
4. Learn basic concepts of Machine Learning.
5. Prepare students for advanced courses in Data Science

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Introduction to Data Science: Importance of data Science-Need for Data Science, What is Data Science? Data Science Process, prerequisites for data science, Components of Data Science, Tools and Skills needed.

Statistics: Data Types, Variable Types, Statistics, Sampling Techniques and Probability.

[**Text Book1**: 1(1.1 to 1.7), 2(2.1 to 2.4)].

08 Hours

Module – II

Probability: Probability Theory, Probability types, Probability Distribution Functions, Bayes Theorem.

Data Modeling and Analytics: Data Science Methodology-Analytics for data science, Example of Data Analytics, Data Analytics Life Cycle-Data Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalization.

[**Text Book1**:2(2.6 to 2.9),4(4.1 to 4.3)]

08 Hours

Module – III

Machine learning –Designing a Learning System, Perspective and Issues in Machine Learning, Supervised learning, Unsupervised learning, Semi- supervised learning, Reinforcement Learning, Role of Machine Learning in Data Science, Data Science vs Machine Learning.

[**Text Book2**: 1(1.2, 1.3), 13]
https://www.geeksforgeeks.org/supervised-machine-learning/?ref=header_ind
https://www.geeksforgeeks.org/ml-types-learning-part-2/?ref=lbp
https://www.geeksforgeeks.org/ml-semi-supervised-learning/?ref=lbp
https://www.geeksforgeeks.org/data-science-vs-machine-learning/?ref=header_ind
https://www.zucisystems.com/blog/what-is-the-role-of-machine-learning-in-data-science

08 Hours

Module – IV

Databases for Data Science – SQL-for Data Science, Basic Statistics with SQL, Data Munging, Filtering, Joins, Aggregation, Advanced NoSQL for Data Science, Document Databases for Datascience, Wide Column Databases for Datascience, Graph Databases for Data Science.
[**TextBook1**:3.1 to 3.1.3, 3.2 to 3.2.4].

08 Hours

Module – V

Data Analytics and Text Mining: Text Mining, Major Text Mining Areas, Text Analytics - Text Analysis Subtasks, Basic Text Analysis Steps
Introduction to NLP: Major Components of NLP, Stages of NLP, Statistical Processing of NLP, Applications of NLP.
[**TextBook1**: 6.1 to 6.3]

08 Hours

Teaching-Learning Process for all modules	Chalk and board, Active Learning, PPT Based presentation, Video

LIST OF EXPERIMENTS

1. Create table and insert values to the table.
   Company Database with tables Employee, Department, Department_location, Project, Works_on.
2. Implementation of DDL commands of SQL with suitable examples
   - Alter table
   - Drop Table
3. Implementation of DML commands of SQL with suitable examples
   - Where clause
   - Update
   - Delete
4. Implementation of Aggregate Function with suitable examples.
5. Implementation of different types of Joins
   - Inner Join
   - Outer Join
   - Natural Join etc.
6. Study and Implementation of
   - Group By & having clause
   - Order by clause
7. Study & Implementation of Database Backup & Recovery commands. Study & Implementation of Rollback, Commit, Savepoint.

Course Outcomes

At the end of the course the student will be able to :

CO1: SQL Proficiency: Students will demonstrate the ability to write and execute complex SQL queries to retrieve, manipulate, and aggregate data from relational databases.
CO2: Data Modeling and Schema Design: Students will understand and apply principles of database design, including normalization and creating efficient database schemas that support data integrity and query performance.
CO3: Data Analysis Techniques: Students will apply fundamental data analysis techniques using SQL, such as filtering, sorting, grouping, and joining tables to derive insights from data.
CO4: Understanding of Data Pipelines: Students will gain knowledge of the role of SQL in data

pipelines, including data extraction, transformation, and loading (ETL) processes for preparing data for analysis.

CO5: Interpreting Results: Students will be able to interpret the results of SQL queries, communicate findings effectively, and visualize data to support decision-making in a data-driven environment.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	Total 25 Marks : Reduced to 15 Marks	
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
	Total 25 Marks : Reduced to 10 Marks	
Lab Component	Lab Record and execution of programs	**15 Marks**
	Lab Test at the end of 15th week	**10 Marks**
	Total	**25 Marks**
Grand Total of IAT Marks		**50 Marks**
Obtaining 40% of marks in both theory and lab component is essential for appearing for SEE		

Suggested Learning Resources:

Text Books:

1. Fundamentals of Data Science**,** Sanjeev J. Wagh, Manisha S. Bhende, and Anuradha D. Thakare, First edition published 2022 by CRC Press.
2. Machine Learning, Tom Mitchell, McGraw Hill, 1997.

E-Resources:

1. https://www.geeksforgeeks.org/supervised-machine-learning/?ref=header_ind
2. https://www.geeksforgeeks.org/ml-types-learning-part-2/?ref=lbp
3. https://www.geeksforgeeks.org/ml-semi-supervised-learning/?ref=lbp
4. https://www.geeksforgeeks.org/data-science-vs-machine-learning/?ref=header_ind
5. **https://www.zucisystems.com/blog/what-is-the-role-of-machine-learning-in-data-science**

CO PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	1	2	1	-	-	-	-	-	-	-	-	3	1	-
CO2	1	2	1	2	1	-	-	-	-	-	-	2	1	-
CO3	1	1	3	1	2	-	1	2	-	-	-	1	2	3
CO4	1	3	1	3	2	-	-	-	-	-	-	2	-	-
CO5	1	2	3	2	-	3	1	1	-	-	-	1	3	2

OBJECT ORIENTED PROGRAMMING USING JAVA (IC)

Course Code	**23CDI33**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:2:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40 hours Theory + 13 Lab slots**	**Total Marks**	**100**
Credits	**04**	**Exam Hours**	**03**

Prerequisite: Basic Programming Skills (C), C++

Course objectives:

This course will enable students to:

1. Learn the basic concepts of object-oriented programming.
2. Understand the basics of JAVA Programming using classes and objects.
3. Gain the knowledge of Inheritance and Interfaces.
4. Expose to the concepts of Packages and Exceptions that occur while programming in JAVA.
5. Acquire the knowledge of multi-threaded programming and String handling in JAVA.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Introduction to Object Oriented Concepts: Procedure Oriented Programming, Object Oriented Programming, Comparison of Object-Oriented Language with C. Introduction to Java,Java Buzzwords, The Byte code, Java Development Kit (JDK), Data types, Variables and arrays, Operators, Control statements, Simple Java programs.

08 Hours

Module – II

Classes, Methods: Classes fundamentals, Declaring objects, Reference variables, this keyword, garbage collection. **Methods:** Method Prototyping, Member functions and Data members, Constructors, Objects and methods, Method Overloading, Objects and arrays, Access modifiers, Setters and getters, Nested classes.

08 Hours

Module – III

Inheritance, Interfaces: Inheritance basics, using super, creating multi-level hierarchy, method overriding, using Abstract classes, using final, **Interfaces**: Defining an Interface, Implementing an Interface, Nested Interfaces, Applying an Interface, variables in Interface, Interfaces can be extended.

	08 Hours
Module – IV	
Packages, Exceptions: Access Protection, Importing Packages. **Exceptions**: Exception handling fundamentals, Exception types, uncaught exceptions, using try and catch, using multiple catch clauses, nested try statements, throw, throws, finally, Java's built-in exceptions. **08 Hours**	
Module – V	
Multi-Threaded Programming, String Handling: What are threads? How to make the classes threadable, Extending threads, Implementing runnable, Synchronization. **String Handling**: String Constructors, String Operations, Character Extraction, String Comparison. **08 Hours**	
Teaching-Learning Process for all modules	Chalk and board, Active Learning, PPT Based presentation, Video
LIST OF EXPERIMENTS	
1	A. Develop a Java program for an advanced arithmetic calculator that takes two integer operands and an operator from the user. The program should be capable of performing addition, subtraction, multiplication, and division. Ensure that the program handles input validation, including checking for the validity of the operator and non-negative values for the operands. After each calculation, ask the user if they want to perform another operation and provide a history of previous calculations upon request.
	B. Write a Java program to generate the first 'n' terms of the Fibonacci series and determine the following: 1. Calculate the sum of all even terms in the series. 2. Find the product of all odd terms in the series. 3. Check and display the largest prime number within the series. 4. Calculate the average of the entire series.
2	A. Develop a Java program showcasing method overloading with a base class "Phone" containing the dial() method, and two subclasses "CameraPhone" and "SmartPhone" that inherit from the base class and enhance its features. The program should demonstrate and print the results of these enhancements.
	B. Develop a Java program illustrating constructor overloading for calculating the area of a rectangle and a circle using appropriate constructors.
3	A. Create a Java program with a vehicle hierarchy, including Vehicle, Car, SportsCar, and Truck classes. Implement methods for starting and stopping in the base class and specialized methods for accelerating, adding turbo boost, and loading cargo in the subclasses, with appropriate method overrides.
	B. Create a Java program that models electronic devices (e.g., smartphones, laptops, and tablets) using a common interface for power management. The program should allow users to interact with the devices and control their power state.
4	A. Develop a Java program that emulates a library system. Create two packages, `library` and `patron`. In the `library` package, define a `Book` class with a private title field. In the `patron` package, implement a `Patron` class that can borrow books. Demonstrate the use of packages, access protection, and class imports. Ensure that the book title remains inaccessible from outside the `library` package due to the `private` access modifier. Create a scenario where a patron, Alice, borrows a book from the library.
	B. Develop a Java lab program that handles exceptions for division by zero and invalid input. Use `try-catch` blocks to catch `Arithmetic Exception` for division by zero and `Input Mismatch Exception` for non-integer input and provide user-friendly error messages.
5	A. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer for every 1 second; second thread computes the square of the number and prints; third thread will print the value of cube of the number.

	B. Design a Java lab program to demonstrate string handling, including creating strings using constructors and literals, concatenating strings, extracting characters at a specified index, and comparing strings for equality.

Course Outcomes:

After studying this course, students will be able to

CO1: Demonstrate a strong understanding of the fundamental concepts of object-oriented programming, including classes, objects, encapsulation, and abstraction.

CO2: Implement object-oriented design principles in their code.

CO3: Design class hierarchies, implement interfaces, and apply polymorphism effectively in their Java applications.

CO4: Apply knowledge of organizing code into packages and handle exceptions for modularity and maintainability.

CO5: Demonstrate the programs by using multithreaded concepts & string handling.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	Total 25 Marks : Reduced to 15 Marks	
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
	Total 25 Marks : Reduced to 10 Marks	
Lab Component	Lab Record and execution of programs	**15 Marks**
	Lab Test at the end of 15th week	**10 Marks**
	Total	**25 Marks**
Grand Total of IAT Marks		**50 Marks**
Obtaining 40% of marks in both theory and lab component is essential for appearing for SEE		

Suggested Learning Resources:

Text Books:

1. Herbert Schildt, "Java The Complete Reference", 7thEdition, TataMcGrawHill, 2013,ISBN 13:978-0072263855, (Chapters 1-11).

Reference Books:

1. E Balagurusamy, "Programming with Java-A primer", 2nd Edition, Tata Mc GrawHill companies, 2009, ISBN-13:978-9351343202.

CO PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	-	3	-	-	-	3	2	-	3	3	-	-
CO2	3	3	3	-	3	-	-	-	3	2	-	3	3	-	-
CO3	3	3	3	2	3	-	-	-	3	2	-	3	3	-	-
CO4	3	3	3	2	3	-	-	-	3	2	2	3	3	2	2
CO5	3	3	3	2	3	-	-	-	3	3	2	3	3	2	2
AVG	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**3**	**2.2**	**2**	**3**	**3**	**2**	**2**

DATA STRUCTURES AND APPLICATIONS			
Course Code	**23CDT34**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course objectives:

This course will enable students to:

1. Get knowledge on pointers, structures, Unions and Dynamic Memory allocation
2. Illustrate linear representation of data structures: Stack, Queues, Lists.
3. Demonstrate sorting and searching algorithms.
4. Get knowledge on non-linear data structures Trees.
5. Apply suitable data structure during application development/Problem Solving.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Introduction: Data Structures, Classifications (Primitive & Non Primitive), Data structure Operations, Arrays, Structures, Self-Referential Structures, and Unions. Pointers and Dynamic Memory Allocation Functions. Pointer as function arguments, Functions returning pointers.

Textbook 1: Chapter 1: 1.2; Chapter 2: 2.1 - 2.6;

Textbook 2: Chapter 1: 1.1 - 1.4; Chapter 4: 4.1 - 4.8; **08 Hours**

Module – II

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Polish notation, Infix to postfix conversion, evaluation of postfix expression. Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Binary Search.

Queues: Definition, Array Representation, Queue Operations, Circular Queues, Circular queues using Dynamic arrays, Dequeues, Programming Examples.

Textbook 1: Chapter 3: 3.1 - 3.7;

Textbook 2: Chapter 6: 6.1 - 6.3, 6.5-6.14; **08 Hours**

Module – III

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation; Garbage Collection. Linked list operations: Traversing, Searching, Insertion, and Deletion.Doubly Linked lists and header linked lists. Linked Stacks and Queues. Sparse Matrices, Programming Examples.

Textbook 1: Chapter 4: 4.1– 4.3, 4.7 - 4.8;

Textbook 2: Chapter 5: 5.1 – 5.9; **08 Hours**

Module – IV

Circular lists and it's basic operations: Circular Singly and Doubly linked lists; Basic operations: Insert, Delete and Display. Applications of linked lists: Addition of long positive integers using circular list, Adding Polynomials. **Hashing:** Hash tables, Hash function, Over flow handling: Open Addressing, Chaining.

Textbook 1: Chapter 4: 4.4 – 4.5; Chapter 8: 8.1 - 8.2;

Textbook 2: Chapter 5: 5.10; **08 Hours**

Module – V

Trees: Terminology, Binary Trees, Properties of Binary trees, Array and linked Representation of Binary Trees, Binary Tree Traversals - Inorder, postorder, preorder; Threadedbinary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples.

Textbook 1: Chapter 5: 5.1 – 5.3, 5.5, 5.7; 08 Hours

Teaching Learning Methodology: Chalk and Talk, PowerPoint presentation, flip teaching,YouTube videos

Course Outcomes

At the end of the course the student will be able to :

CO1: Understand and explore the fundamental concepts of various data structures.

CO2: Analyze and represent various data structures and its operations

CO3: Implement various searching and sorting techniques.

CO4: Design algorithms using different data structures like Stack, Queue, Circular queue, List, Tree and hashing.

CO5: Implement programs with suitable data structure based on the requirements of the real-time application.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Suggested Learning Resources:

Text Books:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, UniversitiesPress, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill,2014.

Reference Books:

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
4. A M Tenenbaum, Data Structures using C, PHI, 1989

5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

E-Resources:

1) https://www.cs.princeton.edu/
2) https://www.opendatastructures.org/ods-cpp
3) https://www.lib.mdp.ac.in/ebook/DSa
4) https://ww.cs-fundamentals.com/data-structures/introduction-to-datastructures.php
5) https://www.cprogramming.com/algorithms-and-data-structures.html
6) https://online-learning.harvard.edu/course/data-structures-and-algorithms

CO PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	2	-	2	-	-	-	-	-	-	2	1	-
CO2	3	3	3	-	2	-	-	-	-	-	-	2	1	-
CO3	3	3	3	1	2	-	-	-	-	-	-	2	1	-
CO4	3	3	3	2	2	-	-	-	-	-	1	2	2	-
CO5	3	3	3	2	2	-	-	-	-	-	1	2	2	-
AVG	3	3	2.8	1.6	2	-	-	-	-	-	1	2	1.4	-

DS LAB USING C			
Course Code	**23CDL35**	**CIE Marks**	**50**
Teaching Hours /Week(L:T:P)	**(0:0:2)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**12 Lab slots**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**03**

Course objectives:

This course will enable students to:

1. Understand the basics of pointers and dynamic memory allocation.
2. Learn concepts of stacks and queues in solving complex problems.
3. Gain knowledge to choose the specific linked lists for implementing real world problems.
4. Acquire knowledge of nonlinear data structure like trees.

LIST OF LABORATORY PROGRAMS

1.	Design, Develop and Implement a menu driven Program in C for the following Array Operations i. Creating an Array of N Integer Elements ii. Display of Array Elements with Suitable Headings iii. Exit. Support the program with functions for each of the above operations.
2.	Design, Develop and Implement a menu driven Program in C for the following Array operations i. Inserting an Element (ELEM) at a given valid Position (POS) ii. Deleting an Element at a given valid Position POS) iii. Display of Array Elements iv. Exit. Support the program with functions for each of the above operations.
3.	Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) i. Push an Element on to Stack ii. Pop an Element from Stack iii. Demonstrate Overflow and Underflow situations on Stack iv. Display the status of Stack v. Exit Support the program with appropriate functions for each of the above operations
4.	Design, Develop and Implement a Program in C for the Evaluation of Suffix expression with single digit operands and operators: +, -, *, /, %, ^.
5.	Design, Develop and Implement a Program in C for Solving Tower of Hanoi problem with n disks.
6.	Implement a Menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fields: *USN, Name, Avg_Marks* a. Create N number of Students Data by inserting at end of the list. b. Insert and Delete at front of the list c. Delete at the end of list d. Display the status of SLL d. Demonstration stack and queue e. Exit
7.	Design and Develop following operations on Doubly Linked List (DLL) of Employee Data with the fields: *SSN, Name, Dept etc.* a. Create a Node of N Employees Data by inserting in front.

	b. Insert a new node to the right of key value. c. Perform Insertion and Deletion at End of DLL d. Display the status of DLL and count the number of nodes e. Exit
8.	Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum size MAX) i. Insert an Element on to Circular QUEUE ii. Delete an Element from Circular QUEUE iii. Demonstrate Overflow and Underflow situations on Circular QUEUE iv. Display the status of Circular QUEUE` v. Exit Support the program with appropriate functions for each of the above operations
9.	Design, Develop and Implement a Program in C for the following operations on Singly Circular Linked List (SCLL) with header nodes. a. Represent and Evaluate a Polynomial P(x,y,z) = 6x2y2z-4yz5+3x3yz+2xy5z2xyz3 b. Find the sum of two polynomials POLY1(x,y,z) and POLY2(x,y,z) and store the result in POLYSUM(x,y,z) Support the program with appropriate functions for each of the above operations.
10.	Design and Develop a program in C for the following operations on Binary Search Tree (BST) of Integers. a. Create a BST of N Integers b. Traverse the BST using Inorder, Preorder and Post Order techniques c. Search a KEY element in BST and display the appropriate message

Course Outcomes:

At the end of the course the student will be able to :

CO1: Understand and explore the fundamental concepts of various data structures.
CO2: Analyze and represent various data structures and its operations
CO3: Implement various searching and sorting techniques.
CO4: Design algorithms using different data structures like Stack, Queue, Circular queue, List, Tree and hashing.
CO5: Implement programs with suitable data structure based on the requirements of the real-time application.

Text Books:

1. Ellis Horowitz and Sartaj Sahani, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, 2014.
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

References:

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning,2014.
2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
4. A M Tenenbaum, Data Structures using C, PHI, 1989
5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

E-Resources:

https://www.youtube.com/watch?v=3Xo6P_V-qns&t=201s
https://ds2-iiith.vlabs.ac.in/exp/selection-sort/index.html
https://ds1-iiith.vlabs.ac.in/data-structures- 1/List%20of%20experiments.html
https://nptel.ac.in/courses/106/102/106102064/
https://ds1-iiith.vlabs.ac.in/exp/stacks-queues/index.html
https://nptel.ac.in/courses/106/102/106102064/

https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html
https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html
https://ds1-iiith.vlabs.ac.in/exp/linked-list/basics/overview.html
https://ds1-iiith.vlabs.ac.in/List%20of%20experiments.html
http://www.nptelvideos.in/2012/11/data-structures-and- algorithms.html
https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/index.html
https://ds1-iiith.vlabs.ac.in/exp/tree-traversal/depth-first- traversal/dft-practice.html

NPTL, MOOC etc. courses on trees and graphs. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html

Assessment Details(both IAT and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination(SEE)		50 marks

Conduct of Practical Examination:

Experiment distribution :

For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Need to change in accordance with university regulations)
  a) For laboratories having only one part → Procedure + Execution + Viva-Voce:
  15+70+15 = 100 Marks
  b) For laboratories having PART A and PART B
  i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
  ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

CO PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	2	-	2	-	-	-	-	-	-	2	1	-
CO2	3	3	3	-	2	-	-	-	-	-	-	2	1	-
CO3	3	3	3	1	2	-	-	-	-	-	-	2	1	-
CO4	3	3	3	2	2	-	-	-	-	-	1	2	2	-
CO5	3	3	3	2	2	-	-	-	-	-	1	2	2	-
AVG	3	3	2.8	1.6	2	-	-	-	-	-	1	2	1.4	-

IT INFRASTRUCTURE AND MANAGEMENT

Course Code	**23CDT36A**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Objectives:
The Student will:

1. Understanding the role of IT infrastructure with its functions and services.(Understanding)
2. Recognize the research, reporting and presentation approach using the latest ICT tools.
3. Study the combination of the technical and management issues in contemporary infrastructure management.
4. Learn the concepts related with Deadlock to solve Problems.
5. Familiarize the Protection and Security Mechanism in Operating System.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Infrastructure management overview: Introduction, IS components, Services of IT infrastructure, welfare of IT, Roles and responsibilities, challenges.

Organizing for Infrastructure management: IT infrastructure design factors, model of IT management, Elucidation methods, Documentation. **08 Hours**

Module – II

Staffing for system management: Introduction, Determining Required Skill Sets and Skill Levels Assessing the Skill Levels of Current Onboard Staff.

Customer Service: Introduction, Key Elements of Good Customer Service: Key Customers, Identifying Key Services, Identifying Key Processes that Support Key Services, Key Suppliers, Integrating the Key Elements of Good Customer Service, Cardinal Sins that Undermine Good Customer Service**.**

08 Hours

Module – III

Performance and Tuning: Introduction, Performance and Tuning Applied to the Five Major Resource Environments: Server Environment, Disk Storage Environment, Database Environment, Network Environment and Desktop Computer Environment.

Problem management: The role of service desk, segregating and integrating service desk, Developing a Problem Management Process, client issues with problem management.

08 Hours

Module – IV

Storage Management: Storage Management Capacity, Storage Management Performance, Storage Management Reliability, Storage Management Recoverability.

Network Management: Key Decisions about Network Management, business IT networks and components, digital transmission, IS vulnerabilities and threats.

08 Hours

Module – V

Strategic Security: Introduction, Developing a Strategic Security Process, IT Strategic planning process, Tools & methodologies of IT strategic planning, Business system planning approach.

Facilities management: Introduction, Major Elements of Facilities Management, Tips to improve facilities management process. **08 hours**

Course outcomes:

The Student will be able to:

CO1: Investigate, critically analyze and evaluate the impact of new and current ICT services to an organization.

CO2: Demonstrate the technical and communications skills that contribute to the operation of ICT services in an organization.

CO3: Reflect critically on the role of an enterprise architect in an organization.

CO4: Gain Knowledge on theoretical, technical and management issues that deliver ICT services to an organization.

CO5: Analyze how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Suggested Learning Resources:

Text Books:

1. Rich Schiesser, IT Systems Management, Pearson Second Edition.
2. IT for Management Turban Volonino.

Reference Books:

1. E Turban, E Mclean and James Wetherbe, ―Information Technology for Management
2. Kenneth C Laudon, Jane P Laudon, ―Management Information Systems
3. Roger S Pressman, ―Software Engineering: A Practitioner‘s Approach
4. James A O‘Brien, ―Management Information Systems
5. Walker Royce, ― Software Project Management: A Unified Framework

E - Resources:

1. https://www.scribd.com/doc/45079962/IT-Infrastructure-Management
2. https://www.scribd.com/document/509694935/IT-Infrastructure-Management-eI9RGuDM0m

BUSINESS PROCESS FUNDAMENTALS

Course Code	**23CDT36B**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives:

This course will enable students to:

1. Understand the basics of business and economy.
2. Learn the basics ethics of entrepreneurship and how to start a business.
3. Understand the roles of ownership, management and leadership.
4. Learn how to design an organization and its operations.
5. Understand the roles and management of human resource in an organization.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Teamwork & Economics

Teamwork in Business, The Foundation of Business – Introduction, Getting Down to Business, Functional Areas of Business, External Forces that Influence Business Activities.

Economics and Business - What is Economics? Perfect Competition and Supply and Demand, Monopolistic Competition, Oligopoly, and Monopoly, Measuring the Health of the Economy, Government's Role in Managing the Economy.

Textbook1: Chapter 1 & 2

08 Hours

Teaching Learning Methodology: Chalk & Talk**,** Demo using Python IDE

Module – II

Ethics and Entrepreneurship

Ethics – Introduction, What is Business Ethics? Identifying Ethical Issues and Dilemmas, Corporate Social Responsibility, Ethical Organizations, The Individual Approach to Ethics**.**

Entrepreneurship - The Nature of Entrepreneurship, The Importance of Small Business to the U.S. Economy, What Industries Are Small Businesses In? Advantages and Disadvantages of Business Ownership, Starting a Business, Why Some Businesses Fail and Where to Get Help.

Textbook1: Chapter 3, 4, 5 & 6

08 Hours

Teaching Learning Methodology: Chalk & Talk, Problem based learning: https://onlinecourses.nptel.ac.in/noc19_ee53/

Module – III

Ownership, Management and Leadership

Ownership - The Ice Cream Men , Factors to Consider, Mergers and Acquisitions.

Management and Leadership - Noteworthy Management, What Do Managers Do?, Planning, Leading, Controlling, Managerial Skills, Applying Your Skills at Notes-4-You.

Textbook1: Chapter 7

08 Hours

Teaching Learning Methodology: Chalk & Talk, Problem based learning: https://onlinecourses.nptel.ac.in/noc19_ee53/

Module – IV

Organizational structures and Operation Management

Organizational structure – Organizing, Organizational Structure: How companies do the job done.

Operation Management - The Challenge: Producing Quality Jetboards, Operations Management in Manufacturing, Managing the Production Process in a Manufacturing Company, Graphical Tools: Gantt and PERT Charts, The Technology of Goods Production, Operations Management for Service Providers, Producing for Quality.

Textbook1: Chapter 8 & 9

08 Hours

Teaching Learning Methodology: Chalk & Talk, Problem based learning: https://onlinecourses.nptel.ac.in/noc22_ge04/

Module – V

Human resources and Motivating employees

Motivating Employees – Motivation, Hierarchy of Needs Theory, Two-Factor Theory, Expectancy Theory, Equity Theory.

Managing Human Resources - Human Resource Management, Developing Employees, What Makes a Great Place to Work? Compensation and Benefits, Performance Appraisal.

Textbook1: Chapter 10 & 11

08 hours

Teaching Learning Methodology: Chalk & Talk, Problem based learning: https://onlinecourses.nptel.ac.in/noc22_ge04/

Course Outcomes:

On completion of this course, the students will be able to:

CO1: Design the basics of any business
CO2: Design the rules and social responsibility of an organization.
CO3: Develop the roles of the interrelated functions of management.
CO4: Construct and manage an organization.
CO5: Utilize the human resources effectively by motivating the employees.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Suggested Learning Resources:

Textbooks:

1. Stephen J. Skripak, Fundamentals of Business, Pamplin college of Business and Virginia Tech Libraries, 2016.

Reference:

6. S.S. Kanaka, Entrepreneurial Development, S-Chand Fourth Edition.
7. Robert D. Hisrish and Michael P. Peters, Entrepreneurship, McGraw – Hill Publication.
8. Poornima M. Charantimath, Entrepreneurship Development Small Business Enterprises, Pearson Education.
9. Thomas. W. Zimmerer & Norman. M. Scarboraugh, Essentials of Entrepreneurship and Small Business Management, PHI.

E-Resources:

1. Lee Angelelli (1994). "Steve Paul Jobs." Retrieved from: http://ei.cs.vt.edu/~history/Jobs.html
2. Warren E. Buffet and Carol Loomis (2003). "America's Growing Trade Deficit Is Selling The Nation Out From Under Us. Here's A Way To Fix The Problem--And We Need To Do It Now." Fortune. November 10, 2003. Retrieved June 9, 2016 from: http://archive.fortune.com/magazines/fortune/fortune_archive/2003/11/10/352872/index.htm
3. Coca Cola Company (2016). "Our Company: Vision, Mission, and Values." Cocacola.com.Retrieved from: http://www.coca-colacompany.com/our-company/mission-vision-values
4. Johnson and Johnson (2016). "Company Structure." Retrieved from: http://www.jnj.com/about-jnj/company-structure
5. Burger King (2016). "About Us." Burger King Website: bk.com. Retrieved from: http://www.bk.com/about-bk
6. Starbucks (2016). "Working at Starbucks." Starbucks.com. Retrieved from: http://www.starbucks.com/careers/working-at-starbucks
7. Fortune (2007). "100 Top MBA Employers." Fortune. Retrieved from: http://archive.fortune.com/magazines/fortune/mba100/2007/full_list/index.html

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

- Real world problem solving by giving group projects.
- Group discussion on finding suitable learning algorithm for the problem.
- Seminar on advanced techniques by the students.

SUPPLY CHAIN MANAGEMENT

Course Code	**23CDT36C**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Objectives:

The objectives of this course are

1. To provide Knowledge on logistics and supply chain management
2. To enable them in designing the distribution network
3. To train the students in knowing the supply chain Analysis
4. Impart knowledge on Dimensions of logistic
5. To know the recent trends in supply chain management

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Introduction to Supply Chain Management: Supply chain - objectives - importance - decision phases - process view competitive and supply chain strategies - achieving strategic fit – supply chain drivers - obstacles – framework – facilities -inventory-transportation-information-sourcing-pricing.

08 Hours

Module – II

Designing the distribution network: Role of distribution - factors influencing distribution - design options - e-business and its impact distribution networks in practice –network design in the supply chain - role of network -factors affecting the network design decisions modeling for supply chain. Role of transportation - modes and their performance – transportation infrastructure and policies - design options and their trade-offs tailored transportation.

08 Hours

Module – III

Supply Chain Analysis: Sourcing - In-house or Outsource - 3rd and 4th PLs - supplier scoring and assessment, selection - design collaboration - Procurement process - Sourcing planning and analysis. Pricing and revenue management for multiple customers, perishable products, seasonal demand, bulk and spot contracts.

08 Hours

Module – IV

Dimensions of Logistics: A macro and micro dimension - logistics interfaces with other areas - approach to analyzing logistics systems - logistics and systems analysis - techniques of logistics system analysis - factors affecting the cost and importance of logistics. Demand Management and Customer Service Outbound to customer logistics systems - Demand Management –Traditional Forecasting CPFRP - customer service - expected cost of stock outs - channels of distribution.

08 Hours

Module – V

Recent Trends in Supply Chain Management-Introduction, New Developments in Supply Chain Management, Outsourcing Supply Chain Operations, Co-Maker ship, The Role of E- Commerce in Supply Chain Management, Green Supply Chain Management, Distribution Resource Planning, World Class Supply Chain Management.

08 Hours

Course Outcomes:

At the end of the course, students will be able to:

CO1: Analyze and design effective strategies for managing and optimizing supply chains to improve operational efficiency, competitiveness, and overall business performance.

CO2: Design and optimize distribution networks and transportation strategies, considering key factors, design options, and the impact of e-business on supply chain performance.

CO3: Analyze sourcing, procurement, and pricing strategies, including supplier selection, collaboration, and revenue management for various customer demands and product types.

CO4: Analyze logistics systems, apply demand management techniques, and optimize customer service and distribution to improve efficiency and reduce costs.

CO5: Evaluate and apply recent trends in supply chain management, including digitalization, sustainability, and innovative technologies, to enhance supply chain performance.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Suggested Learning Resources:

Text Books:

1. Sunil Chopra and Peter Meindl, Supply Chain Management – "Strategy, Planning and Operation", 3rd Edition, Pearson/PHI,2007.
2. Supply Chain Management by Janat Shah Pearson Publication 2008.

Reference Books:

1. A Logistic approach to Supply Chain Management – Coyle, Bardi, Longley, Cengage Learning, 1/e
2. Donald J Bowersox, Dand J Closs, M Bixby Coluper, "Supply Chain Logistics Management", 2nd edition, TMH,2008.
3. Wisner, Keong Leong and Keah-Choon Tan, "Principles of Supply Chain Management A Balanced Approach", Cengage Learning,1/e
4. David Simchi-Levi et al, "Designing and Managing the Supply Chain" –Concepts

CO PO Mapping:

POS / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	2	2	-	-	-	-	3	-	2
CO2	-	-	3	2	3	-	-	-	2	-	-	3	2	2
CO3	-	3	-	-	-	2	-	2	2	-	-	2	-	2
CO4	2	-	-	-	3	-	-	-	-	-	2	2	3	2
CO5	-	-	3	-	-	-	-	-	-	-	-	-	-	-

HUMAN COMPUTER INTERACTION

Course Code	**23CDT36D**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P: S)	**3:0:0:0**	**SEE Marks**	**50**
Total Hours of Pedagogy	**40**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course Learning Objectives

1. To learn the foundations of Human Computer Interaction.
2. To become familiar with the design technologies for individuals and persons with disabilities.
3. To be aware of mobile HCI.
4. To learn the guidelines for user interface.
5. Develop meaningful user interface.

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module – I

Introduction:

Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

08 Hours

Module – II

Design Process & Screen Designing:

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.

Screen Designing: Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

08 Hours

Module – III

Windows and Components

Windows – New and Navigation schemes selection of window, selection of devices based and screen-based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

08 Hours

Module – IV

HCI in the Software Process

HCI in the software process, The software life cycle Usability engineering Iterative design and prototyping Design Focus: Prototyping in practice Design rationale Design rules Principles to support usability Standards Golden rules and heuristics HCI patterns Evaluation techniques, Goals of evaluation, Evaluation through expert analysis, Evaluation through user participation, Choosing an evaluation method. Universal design, Universal design principles Multi-modal interaction**.**

08 Hours

Module – V

Cognitive Models

Cognitive models Goal and task hierarchies Design Focus: GOMS saves money Linguistic models The challenge of display-based systems Physical and device models Cognitive architectures Ubiquitous computing and augmented realities Ubiquitous computing applications research Design Focus: Ambient Wood – augmenting the physical Virtual and augmented reality Design Focus: Shared experience Design Focus: Applications of augmented reality Information and data visualization Design Focus: Getting the size right.

08 Hours

Teaching-Learning Process	Chalk and board, Active Learning, Demonstration, Web content, Case Study

Course Outcomes

On completion of this course, the students will be able to,

CO1: Design effective dialog for HCI.

CO2: Design effective HCI for individuals and persons with disabilities.

CO3: Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.

CO4: Assess the importance of user feedback.

CO5: Design and develop meaningful user interface.

Assessment Details (both IAT and SEE)

Theory Component	IAT-1 after completion 45 to 50% Syllabus	25 Marks
	IAT-2 after completion 95 to 100% Syllabus	25 Marks
	Average of two IATs	**25 Marks**
	CCE-1	25 Marks
	CCE-2	25 Marks
	Average of two CCEs	**25 Marks**
Grand Total of IAT Marks (min marks 20 / 50)		**50 Marks**
SEE conducted for 100 and scaled down to 50 **(min marks 18/50)**		**50 Marks**
IAT + SEE (min marks 40)		**100 Marks**

Suggested Learning Resources:

Textbooks:

1. Wilbert O. Galitz, The Essential Guide to user Interface Design: An Introduction to GUI Design Principles and Techniques, Wiley, Second Edition 2002. (Module I, II, III)
2. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, Human Computer Interaction, 3rd Edition, Pearson Education, 2005 (Module IV, V)

Reference:

1. Andrew Monk, Fundamentals of Human Computer Interaction, 1st Edition, Academic Press, 2014.
2. Ben Shneiderman, Catherine Plaisant, Maxine S. Cohen, Steven M. Jacobs, Designing the User Interface: Strategies for Effective Human-Computer Interaction, 5th Edition, Pearson Education Asia Pearson, 2009
3. Brian Fling, Mobile Design and Development, First Edition, O'Reilly Media Inc., 2009

4. Bill Scott and Theresa Neil, Designing Web Interfaces, First Edition, O'Reilly, 2009.

Weblinks and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106103115
2. https://archive.nptel.ac.in/courses/106/106/106106177/
3. https://www.tutorialspoint.com/human_computer_interface/index.htm

SOCIAL CONNECT AND RESPONSIBILITY

Course Code	**23UHV37**	**CIE Marks**	**100**
Teaching Hours/Week (L:T:P: S)	**0:0:2:0**	**SEE Marks**	**--**
Total Hours of Pedagogy	**30 hours Practical Session**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**--**

Course objectives: The course will enable the students to:

1. Provide a formal platform for students to communicate and connect to the surrounding.
2. create a responsible connection with the society.
3. Understand the community in general in which they work.
4. Identify the needs and problems of the community and involve them in problem –solving.
5. Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.
6. Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes.

General Instructions - Pedagogy :

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. In addition to the traditional lecture method, different types of innovative teaching methods may be adopted so that the activities will develop students' theoretical and applied social and cultural skills.
2. State the need for activities and its present relevance in the society and Provide real-life examples.
3. Support and guide the students for self-planned activities.
4. You will also be responsible for assigning homework, grading assignments and quizzes, and documenting students' progress in real activities in the field.
5. Encourage the students for group work to improve their creative and analytical skills.

Contents :

The course is mainly activity-based that will offer a set of activities for the student that enables them to connect with fellowhuman beings, nature, society, and the world at large.

The course will engage students for interactive sessions, open mic, reading group, storytelling sessions, and semester-longactivities conducted by faculty mentors.

In the following a set of activities planned for the course have been listed:

Module – I

Plantation and adoption of a tree:

Plantation of a tree that will be adopted for four years by a group of BE / B.Tech students. (ONE STUDENT ONE TREE) They will also make an excerpt either as a documentary or a photo blog describing the plant's origin, its usage in daily life, its appearance in folklore and literature. **06 Hours**

Module – II

Heritage walk and crafts corner:

Heritage tour, knowing the history and culture of the city, connecting to people around through their history, knowing the city and its craftsman, photo blog and documentary on evolution and practice of various craft forms. **06 Hours**

Module – III

Organic farming and waste management:

Usefulness of organic farming, wet waste management in neighboring villages, and implementation in the campus. **06 Hours**

Module – IV

Water conservation:

Knowing the present practices in the surrounding villages and implementation in the campus,

documentary or photo blog presenting the current practices. **06 Hours**

Module – V

Food fest:

City's culinary practices, food lore, and indigenous materials of the region used in cooking/ food festivals. **06 Hours**

Course Outcomes:

The students will be able to :

CO1: Create a responsible connection with the society to address real-world societal challenges, including issues of corporate social responsibility (CSR) and sustainability.

CO2: Identify the needs and problems of the community and involve them in problem –solving.

CO3: Implement practices that promote sustainability in personal and professional life, contributing to long-term societal welfare.

CO4: Work collaboratively in teams to solve complex social problems, demonstrating teamwork, empathy, and collective responsibility.

CO5: Demonstrate the implemented idea through presentation and report.

E-Resources:

https://ffreedom.com/english/about-app?gad_source=1&gclid=CjwKCAjw74e1BhBnEiwAbqOAjBOnuaO-a6CMVTjwubTiz2e13DWkkZ7ZpwX8PELXz5NRhe2a5cG2dBoCjwQQAvD_BwE

https://prasarbharati.gov.in/dd-kisan-homepage/

CO PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12
CO1							3	3				
CO2						3						
CO3							3					3
CO4								2	3	3		
CO5									3	3		

ACTIVITIES:

Jamming session, open mic, and poetry: Platform to connect to others. Share the stories withothers. Share the experience of Social Connect. Exhibit the talent like playing instruments, singing, one-act play, art-painting, and fine art.

PEDAGOGY:

The pedagogy will include interactive lectures, inspiring guest talks, field visits, social immersion, and a course project. Applying and synthesizing information from these sources to define the social problem to address and take up the solution as the course project, with your group. Social immersion with NGOs/social sections will be a key part of the course. Will all leadto the course project that will address the needs of the social sector?

COURSE TOPICS:

The course will introduce social context and various players in the social space, and present approaches to discovering and understanding social needs. Social immersion and inspiring conversional will culminate in developing an actual, idea for problem-based intervention, based on an in-depth understanding of a key social problem.

Duration:

A total of 40 - 50 hrs engagement per semester is required for the 3rd semester of the B.E.
/B.Tech. program. The students will be divided into groups. Each group will be handled by faculty mentor. Faculty mentor will design the activities (particularly Jamming sessions open mic ,and poetry) Faculty mentors has to design the evaluation system as per VTU guidelines ofscheme & syllabus.

Guideline for Assessment Process:

Continuous Internal Evaluation (CIE):

After completion of the course, the student shall prepare, with daily diary as reference, a comprehensive

report in consultation with the mentor/s to indicate what he has observed and learned in the social connect period. The report should be signed by the mentor. The report shall be evaluated on the basis of the following criteria and/or other relevant criteria pertaining to the activity completed. Marks allotted for the diary are out of 50. Planning and scheduling the socialconnect Information/Data collected during the social connect Analysis of the information/data and report writing Considering all above points allotting the marks as mentioned below

Excellent : 80 to 100
Good : 60 to 79
Satisfactory : 40 to 59
Unsatisfactory and fail : <39

Special Note:

NO SEE – Semester End Exam – Completely Practical and activities based evaluation

Pedagogy – Guidelines:
It may differ depending on local resources available for the study as well as environment and climatic differences, location and time of execution.

Sl No	Topic	Group size	Location	Activity execution	Reporting	Evaluation Of the Topic
1.	**Plantation and adoption of a tree:**	May be individual or team	Farmers land/ parks / Villages / roadside/ community area / College campus etc…..	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
2.	**Heritage walk and crafts corner:**	May be individual or team	Temples / monumental places / Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc…..	Site selection /proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
3.	**Organic farming and waste management:**	May be individual or team	Farmers land / parks / Villages visits / roadside/ community area / College campus etc…..	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
4.	**Water conservation:** & conservation techniques	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers / campus etc…..	site selection / proper consultation/Continuous monitoring/ Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty
5.	**Food fest: Practices in society**	May be individual or team	Villages/ City Areas / Grama panchayat/ public associations/Government Schemes officers/ campus etc…..	Group selection / proper consultation / Continuous monitoring / Information board	Report should be submitted by individual to the concerned evaluation authority	Evaluation as per the rubrics Of scheme and syllabus by Faculty

Plan of Action (Execution of Activities)

Sl.NO	Practice Session Description
1	Lecture session in field to start activities
2	Students Presentation on Ideas
3	Commencement of activity and its progress
4	Execution of Activity
5	Execution of Activity
6	Execution of Activity
7	Execution of Activity
8	Case study based Assessment, Individual performance
9	Sector/ Team wise study and its consolidation
10	Video based seminar for 10 minutes by each student At the end of semester with Report.

- Each student should do activities according to the scheme and syllabus.
- At the end of semester student performance has to be evaluated by the faculty for the assignedactivity progress and its completion.
- At last consolidated report of all activities from 1st to 5th, compiled report should be submitted asper the instructions and scheme.

Assessment Details for CIE (both CIE and SEE)

Weightage	CIE – 100%	• Implementation strategies of the project (NSS work). • The last report should be signed by NSS Officer, the HOD and principal. • At last report should be evaluated by the NSS officer of the institute. • Finally the consolidated marks sheet should be sent to the university and also to be made available at LIC visit.
Field Visit, Plan, Discussion	10 Marks	
Commencement of activities and its progress	20 Marks	
Case study based Assessment Individual performance with report	20 Marks	
Sector wise study & its consolidation 5*5 = 25	25 Marks	
Video based seminar for 10 minutes by each student At the end of semester with Report. Activities 1 to 5, 5*5 = 25	25 Marks	
Total marks for the course in eachsemester	100 Marks	
For each activity, 20 marks CIE will be evaluated for IA marks at the end of semester, Report and assessment copy should be made available in the department.		
Students should present the progress of the activities as per the schedule in the prescribed practical session in the field. There should be positive progress in the vertical order for the benefit of society in general through activities.		

INTRODUCTION TO ANDROID PROGRAMMING

Course Code	**23CDL38A**	**CIE Marks**	**50**
Teaching Hours /Week(L:T:P)	**(0:0:2)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**12 Lab slots**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**03**

Course objectives:

1. Outline the Android SDK features and the Development Framework and understanding Activities.
2. Learn adaptive, responsive user interfaces that work across a wide range of devices.
3. Identify background work and long-running tasks in Android applications
4. Describe the concepts of Storing, sharing and retrieving data in Android applications
5. Learn permissions, security and performance affect applications.

Lab Experiments

1	Installation of Android studio.
2	Development Of Hello World Application.
3	Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
4	Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout).
5	Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.
6	Design an android application Send SMS using Internet.
7	Create an android application using Fragments.
8	Design an android application Using Radio buttons.
9	Design an android application for menu.
10	Create a user registration application that stores the user details in a database table.

Course outcomes:

At the end of the course, the student will be able to:

- Comprehend the basic features of Android Platform and Create Activities in Android.
- Demonstrate the design concepts of user interface using components and views in Android.
- Create and use databases for Android Application.
- Implement messaging services in Android.
- Deploy mobile applications in various market place for distribution

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Text book				
1	Beginning Android Application Development	Wei – Meng Lee	Wiley publications	2007
2	Professional Android 4 Application Development	Alex Berson and Stephen J. Smith	Wiley publications	2012
Reference Books				

1	Beginning Android 3	Mark Murphy	Apress Springer India Pvt. Ltd	1st Edition, 2011
2	Pro Android 4	Sayed Hashimi, Satya Komatineni, Dave MacLean	Apress Springer India Pvt Ltd	1st Edition, 2012
3	Professional Android 2 Application Development	Reto Meier	Wiley India Pvt. Ltd	1st Edition, 2012

Web links and Video Lectures:

1) https://developers.google.com/training/adf
2) https://goo.gl/ADKvq8
3) https://innovator.samsungmobile.com

Assessment Details(both IAT and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination(SEE)		50 marks

ADVANCED PYTHON PROGRAMMING

Course Code	**23CDL38B**	**CIE Marks**	**50**
Teaching Hours /Week(L:T:P)	**(0:0:2)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**12 Lab slots**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**03**

Course objectives:

1. Learn Syntax and Semantics and create Functions in Python.
2. Handle Strings and Files in Python.
3. Understand Lists, Dictionaries and Regular expressions in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Build Web Services and introduction to Network and Database Programming in Python.

Lab Experiments

1	Data Analysis and Visualization: • Implement a program to analyze datasets using Pandas, perform data cleaning, manipulation, and generate visualizations using Matplotlib or Seaborn.
2	Machine Learning Projects: • Develop a machine learning model to predict something relevant to the engineering field, such as predicting energy consumption, stock prices, or system failure using libraries like Scikit-learn or Tensor Flow.
3	Web Scraping and API Integration: • Create a program that scrapes data from websites or integrates with public APIs to gather engineering-related information. This could involve retrieving real-time weather data, stock market data, or scientific data from APIs.
4	Internet of Things (IoT) Projects: • Use Python to interface with IoT devices, sensors, or actuators. For example, create a program to read data from sensors and control IoT devices using platforms like Raspberry Pi or Arduino.
5	Network Analysis and Security: • Develop a program to analyze network traffic or simulate network protocols. Explore cybersecurity concepts by implementing basic encryption/decryption algorithms or network packet analysis tools.
6	Data Structures and Algorithms: • Implement advanced data structures (e.g., graphs, trees, heaps) and algorithms (e.g., sorting, searching, dynamic programming) in Python. Demonstrate their applications and efficiencies in solving engineering-related problems.
7	Computer Vision Projects: • Use libraries like OpenCV to work on image processing and computer vision tasks. Develop programs for object detection, face recognition, or gesture recognition.
8	Natural Language Processing (NLP) Projects: • Create programs that analyze engineering-related texts. This could involve sentiment analysis on engineering-related articles, technical document summarization, or keyword extraction from research papers.
9	Parallel and Concurrent Programming: • Explore the concepts of multithreading, multiprocessing, and asynchronous programming in Python. Develop programs that utilize these concepts to solve engineering problems, emphasizing performance improvements.
10	GUI Applications and User Interfaces: • Design and develop GUI applications using libraries like Tkinter or PyQt. Create engineering tools or simulations with user-friendly interfaces for tasks like circuit simulation, mathematical modeling, or data analysis.

Course Outcomes

CO1: Examine Python syntax and semantics and be fluent in the use of Python flow control and functions

CO2: Demonstrate proficiency in handling Strings and File Systems

CO3: Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.

CO4: Interpret the concepts of Object-Oriented Programming as used in Python.

CO5: Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Text Books:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

References:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson

Nptel Resources:

1. NOC: Machine Learning, ML (Video): https://nptel.ac.in/courses/106106202/
2. NOC: Introduction to Machine Learning (Video): https://nptel.ac.in/courses/106105152/
3. NOC: Introduction to Machine Learning (Course sponsored by Aricent) (Video): https://nptel.ac.in/courses/106106139/

Assessment Details(both IAT and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination(SEE)		50 marks

INTRODUCTION TO OFFICE TOOLS

Course Code	**23CDL38C**	**CIE Marks**	**50**
Teaching Hours /Week(L:T:P)	**(0:0:2)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**12 Lab slots**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**03**

Course Objectives:

1. Attain a comprehensive understanding of Microsoft Office tools including Word, Excel, PowerPoint, and potentially others like Access, Outlook, or Publisher.
2. Learn how to use Office tools effectively to increase productivity in academic, professional, and personal tasks.
3. Develop the ability to adapt and apply acquired skills to different scenarios and tasks requiring Office applications.

Lab Experiments

MS WORD:

1	Formatting tools like font styles, sizes, colors, alignment, and line spacing.
2	Create and customize document templates for different purposes (e.g., resumes, flyers, reports).
3	Explore creating and formatting tables, inserting and formatting images, shapes, and SmartArt.
4	Introduce basic arithmetic operations, SUM, AVERAGE, MAX, MIN, etc.

Microsoft PowerPoint:

5	Creating Presentations: Cover slide layouts, inserting text, images, shapes, and slide transitions.
6	Animation and Multimedia: Practice adding animations, audio, video, and customizing timing.
7	Master Slides: Explore using master slides for consistent formatting and design.
8	Microsoft Access: Design and create a simple database, define relationships, and run queries.
9	**Outlook:** Manage emails, calendar appointments, tasks, and rules for organizing mail.
10	**OneNote:** Explore note-taking, organizing information, and collaboration features.
11	**Publisher:** Designing various print materials like newsletters, brochures, or posters.
12	**SharePoint:** Introduction to document management, team sites, and collaboration tools**.**

Course Outcomes (Course Skill Set):

At the end of the course the student will be able to:

CO 1. Know the basics of computers and prepare documents, spreadsheets, make small presentations with audio, video and graphs and would be acquainted with internet.

CO 2. Create, edit, save and print documents with list tables, header, footer, graphic, spellchecker, mail merge and grammar checker

CO 3. Attain the knowledge about spread sheet with formula, macros spell checker etc.

CO 4. Demonstrate the ability to apply application software in an office environment.

CO 5. Use Google Suite for office data management tasks

Text Books:

1. New Perspectives Microsoft Office 365 & Office 2019 Introductory
   Patrick Carey, Katherine T. Pinard, Ann Shaffer, Mark Shellman

2. Microsoft Office 2010 Introductory
   Gary B. Shelly, Misty E. Vermaat

3. Microsoft PowerPoint 2010
   Illustrated Brief - Office 2010)
   David W. Beskeen

Digital Resources:

1. https://www.geeksforgeeks.org/what-are-office-tools/
2. https://www.tutorialspoint.com/basics_of_computers/basics_of_computers_office_tools.htm
3. https://www.coursera.org/courses?query=microsoft%20office

Assessment Details(both IAT and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
15 marks	15 marks	20 marks
Semester End Examination(SEE)		50 marks

INTRODUCTION TO LINUX/UNIX SHELL PROGRAMMING

Course Code	**23CDL38D**	**CIE Marks**	**50**
Teaching Hours /Week(L:T:P)	**(0:0:2)**	**SEE Marks**	**50**
Total Hours of Pedagogy	**-**	**Total Marks**	**100**
Credits	**01**	**Exam Hours**	**03**

Course objectives:

This course will enable students to**,**

1. Understand effective use of Unix concepts, commands and terminology.
2. Identify, access, and evaluate UNIX file system.
3. Understand UNIX command syntax and semantics.
4. Read and understand specifications, scripts and programs.
5. Analyze Facility with UNIX Process.

Course Content:

Introduction to Shell scripting:

- Use of Basic UNIX Shell Commands and options related to them: vi, ls, mkdir, rmdir, cd, cat, touch, file, wc, sort, cut, who, man etc.
- Commands related to inode, I/O redirection and piping.
- Shell Programming: Shell script exercises based on following:

  (i) Interactive shell scripts
  (ii) Positional parameters
  (iii) Arithmetic
  (iv) if-then-fi, if-then- else-fi, nested if-else
  (v) Logical operators
  (vi) else + if equals elif, case structure
  (vii) while, until, for loops, use of break

Programs/Assignment on:

1. Write a shell script to check whether the entered username and password is valid or not.
2. Write a shell script to add, subtract, multiply, divide two numbers and add two strings.
3. Write a shell script that accepts two file names as arguments, and checks the permissions of these files are similar or different.
4. Write a shell program to perform convert lowercase to uppercase using tr statement.
5. Write a non-recursive shell script that accepts any number of arguments and prints them in a reverse order.
6. Write a shell script to check the given file is a directory or not.
7. Write a shell script to compute GCD & LCM of two numbers.
8. Write a shell script to find whether a given number is prime.
9. Write a shell script to check whether the given year is Leap year or not.
10. Write a shell script to check whether the given string is Palindrome or not.

Course Outcomes

CO1: Know the basics of Unix concepts and commands.
CO2: Evaluate the UNIX file system.
CO3: Apply Changes in file system.
CO4: Write scripts and programs.
CO5: Analyse Facility with UNIX system process.

Text Book:

1) Sumitabha Das: "UNIX – Concepts and Applications", Tata McGraw Hill, Noida, 4th Edition, 15th Reprint, 2011, ISBN-13: 978-0-07-063546-3.

2) Behrouz A. Forouzan and Richard F. Gilberg: "UNIX and Shell programming", Cengage Learning, India, 1st Edition, 2005, ISBN: 81-35-0325-9.

3) M G Venkatesh Murthy: "UNIX and Shell programming", Pearson Education, Delhi, 1st Edition, 2005, ISBN: 81-7758-745-5.

E-Resources:

1) http://www.mhhe.com/das/uca
2) http://www.tutorialspoint.com/unix/unix_tutorials.pdf.
3) http://www.perldoc.perl.org/

Assessment Details(both IAT and SEE)

Continuous Internal Assessment of Laboratory/Practical Courses		
Lab Test 1	Lab Test 2	Lab Records
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Semester End Examination(SEE)		50 marks

Conduct of Practical Examination:

Experiment distribution :

For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Need to change in accordance with university regulations)
  a) For laboratories having only one part → Procedure + Execution + Viva-Voce:
  15+70+15 = 100 Marks
  b) For laboratories having PART A and PART B
  i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
  ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks

CO PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	2	-	-	-	-	-	3	3	3	2
CO2	3	3	3	3	3	-	-	-	-	-	3	2	2	2
CO3	3	3	3	2	2	-	-	-	-	-	3	3	3	1
CO4	3	3	3	3	3	-	-	-	-	-	3	3	3	2
CO5	3	3	3	3	3	-	-	-	-	-	3	3	3	3